WHAT IS CLAIMED IS:

1. A vibration control method of a stage apparatus having a main stage body that is driven over a base plate, which controls vibration by applying a force to the base plate, wherein a position of a center of gravity and of a major inertia axis of the stage apparatus, is detected when vibration is applied to the base plate, and the force is adjusted based on the detected position of the center of gravity and the detected position of the major inertia axis.

2. A vibration control method according to claim 1, wherein the vibration is applied to the base plate by driving the main stage body.

3. A vibration control method according to claim 1, wherein the position of the center of gravity and the position of the major inertia axis are detected for different positions of the main stage body relative to the base plate.

4. A stage apparatus having a main stage body that driven over a base plate and a force actuator that applies a force to the base plate, comprising:

a detector that detects a position of a center of gravity and of a major inertia axis of the stage apparatus when vibration is applied to the base plate; and

a controller that controls the force applied to the base plate by the force actuator based on the position of the center of gravity and the position of the major inertia axis detected by the detector.

5. A stage apparatus according to claim 4, wherein the force actuator applied the force towards the detected position of the center of gravity.

6. An exposure apparatus that exposes a pattern of a mask held by a mask stage onto a substrate held by a substrate stage, wherein at least one of the mask stage and the substrate stage is the stage apparatus according to claim 4.

7. An exposure apparatus according to claim 6, wherein the exposure apparatus is a scanning exposure apparatus that exposes the pattern of the mask onto the substrate while synchronously scanning the mask and the substrate.

8. A stage apparatus having a main stage body that is driven over a base plate, comprising:

a drive apparatus having a stationary portion and a movable portion that drive the main stage body;

a support arranged to vibrate independently from the base plate; and

a reaction force transmission apparatus, provided between the support and the stationary portion, and that transmits a reaction force generated in the stationary portion by the movement of the main stage body to the support, wherein the reaction force transmission apparatus comprises an EI core actuator made by connecting an E-type core and an I-type core.

9. A stage apparatus according to claim 8, further comprising a measuring instrument that measures a relative position between the E-type core and the I-type core, and a controller that controls driving of the EI core actuator based on the measurements made by the measuring instrument.

10. An exposure apparatus that exposes a pattern of a mask held by a mask stage onto a substrate held by a substrate stage, wherein at least one of the mask stage and the substrate stage is the stage apparatus according to claim 8.

11. An exposure apparatus according to claim 10, wherein the exposure apparatus is a scanning exposure apparatus that exposes the pattern of the mask onto the substrate while synchronously scanning the mask and the substrate.

12. A stage apparatus having a main stage body that is driven over a base plate and a force actuator that applies a force to the base plate, comprising;

a memory that stores vibration characteristics of the base plate corresponding to different positions of the main stage body;

a vibration detector that detects the vibration characteristics of the base plate; and

a controller that controls the force actuator based on the vibration characteristics detected by the vibration detector and stored in the memory.

13. A stage apparatus according to claim 12, wherein the memory stores the vibration characteristics of the base plate when the main stage body is driven.

14. An exposure apparatus that exposes a pattern of a mask held by a mask stage onto a substrate held by a substrate stage, wherein at least one of the mask stage and the substrate stage is the stage apparatus according to claim 12.

15. An exposure apparatus according to claim 14, wherein the exposure apparatus is a scanning exposure apparatus that exposes the pattern of the mask onto the substrate while synchronously scanning the mask and the substrate.

16. An exposure apparatus that transfers a pattern of a mask onto a substrate by a projection optical system, comprising:

a detector that detects a relative velocity between the projection optical system and the substrate in an optical axis direction of the projection optical system; and

a drive controller that causes at least the substrate the follow the projection optical system in the optical axis direction based on the relative velocity detected by the detector.

17. An exposure apparatus according to claim 16, wherein the detector detects the relative velocity by determining an acceleration applied to the projection optical system and an acceleration applied to the substrate.

18. An exposure apparatus according to claim 16, wherein the detector detects the relative velocity by determining the relative position of the projection optical system and the substrate in the optical axis direction.

19. An exposure apparatus according to claim 16, further comprising:

a stage that moves while holding the substrate; and

a base plate that movably supports the stage;

wherein the detector detects the relative velocity through the base plate.

20. An exposure apparatus according to claim 16, wherein the exposure apparatus is a scanning exposure apparatus that exposes the pattern of the mask onto the substrate while synchronously scanning the mask and the substrate.

21. An exposure apparatus that includes an illumination optical system that illuminates a mask in order to transfer a pattern of the mask onto a substrate, comprising:

a support that supports at least one portion of the illumination optical system and the mask;

an illumination region defining unit that sets an illumination region of the mask, arranged so that the illumination region defining unit vibrates independently of the support;

a detector that detects a relative positional relationship between the at least one portion of the illumination optical system and the illumination region defining unit; and

a controller that controls adjustment of a position of the illumination region defining unit based on the relative positional relationship detected by the detector.

22. An exposure apparatus according to claim 21, wherein the illumination region defining unit changes a size of the illumination region of the mask depending upon whether or not exposure is executed.

23. An exposure apparatus according to claim 21, wherein the controller causes adjustment of the position of the illumination region defining unit within a two-dimensional plane.

24. An exposure apparatus according to claim 21, wherein the exposure apparatus is a scanning exposure apparatus that exposes the pattern of the mask onto the substrate while synchronously scanning the mask and the substrate.

25. An exposure method in which an illumination optical system illuminates a mask in order to transfer a pattern of the mask onto a substrate, comprising:

supporting at least one portion of the illumination optical system and the mask on a common support;

arranging an illumination region defining unit that sets an illumination region of the mask, so that the illumination region defining unit vibrates independently of the common support;

detecting a relative positional relationship between the at least one portion of the illumination optical system and the illumination region defining unit; and

adjusting a position of the illumination region defining unit based on the detected relative positional relationship.

26. A method according to claim 25, wherein the illumination region defining unit changes a size of the illumination region of the mask depending upon whether or not exposure is executed.

27. A method according to claim 25, wherein the position of the illumination region defining unit is adjusted within a two-dimensional plane.

28. An exposure apparatus that transfers a pattern of a mask onto a substrate through a projection optical system located between the mask and the substrate, comprising:

an optical member arranged between the mask and the projection optical system;

a measurement instrument that measures a relative positional relationship between the optical member and the projection optical system; and

a controller that controls adjustment of a position of the image of the pattern of the mask that is projected onto the substrate based on the relative positional relationship measured by the measurement instrument.

29. An exposure apparatus according to claim 28, further comprising a mask stage that moves while holding the mask, and wherein the controller causes the mask stage to be driven based on the relative positional relationship measured by the measurement instrument.

30. An exposure apparatus according to claim 28, wherein the optical member is supported by the projection optical system.

31. An exposure apparatus according to claim 28, wherein the optical member transmits parallel light beams into the projection optical system.

32. An exposure apparatus according to claim 28, wherein the exposure apparatus is a scanning exposure apparatus that exposes the pattern of the mask onto the substrate while synchronously scanning the mask and the substrate.

33. A method of transferring a pattern of a mask onto a substrate through a projection optical system located between the mask and the substrate, comprising:

arranging an optical member between the mask and the projection optical system;

measuring a relative positional relationship between the optical member and the projection optical system; and

adjusting a position of the image of the pattern of the mask that is projected onto the substrate based on the measured relative positional relationship.

34. A method according to claim 33, wherein the adjusting step includes causing a mask stage that moves while holding the mask to be driven based on the measured relative positional relationship.

35. A method according to claim 33, wherein the optical member is supported by the projection optical system.

36. A method according to claim 33, wherein the optical member transmits parallel light beams into the projection optical system.